ABSTRACTS

BIOLOGICAL SCIENCES - AQUATIC

WHIRLING DISEASE IN MONTANA'S SPRING CREEKS [AFS]

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Spring creeks in Montana provide important wild trout habitat, as well as supporting other nearby fisheries. These thermally stable, cool, clear, nutrient-rich waters allow spawning of trout to occur earlier and over extended periods, and provide ideal conditions for trout rearing, growth, and survival. In some river systems, spring creeks may sustain the bulk of spawning adults, and hence recruitment of young fish. However, these same characteristics may also increase whirling disease infection. Higher nutrient loads may foster high densities of *Tubifex tubifex*, a vector of the disease, and the moderate, steady temperatures may prolong the release of the infectious *triactinmyon* (TAM) stage of the disease. In non-spring streams, infection appears to follow a seasonal cycle of highs in the spring and fall during moderate temperatures, and lows in the summer and winter. Such a cycle may not occur in spring creeks and despite their importance, the role of whirling disease in Montana's spring creeks is unclear. The purpose of this study was to investigate how widespread whirling disease is in Montana spring creeks, and to determine factors that might affect its severity. We hypothesized that whirling disease severity would be of higher magnitude and longer duration in spring creeks, due to habitat and thermal characteristics. Nine spring creeks were sampled from January 2000 to September 2001 within eight watersheds in western Montana. Six 'extensive' sites (Anceny, Blaine, Clark Canyon, Kliendschmidt, Rock Creek and Mitchell-Slough) were sampled in the spring and fall to assess the extent of infection over a wider geographic area. Three 'intensive' sites (Ben Hart, Nelson and Willow Springs) were sampled monthly to assess seasonal changes in infection in relation to temperature, spawning timing, and *T. tubifex* abundance. Severity of infection was measured with sentinel fish cages using a paired sampling design, with cages deployed simultaneously in a spring creek and adjacent river. Redd counts were conducted on the three intensive sites twice monthly to determine timing and location of spawning. Thermal units from time of spawning were used to calculate time of emergence in relation to whirling disease infection levels. *T. tubifex* abundance, water quality, and habitat

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characteristics were measured to determine their association with the occurrence or severity of infection. Infection severity varied among the nine spring creeks. Five sites had little or no infection (<1.0) (Anceny, Clark Canyon, Blaine, Mitchell-Slough and Nelson); two sites had moderate infection (1.0-2.5) (Ben Hart and Blaine); and two sites showed severe infections (>2.5) (Kliendschmidt and Willow Springs). The seasonal cycle of infection in spring creeks was much different than in non-spring streams. In these spring streams infection peaked during winter months, declined sharply in the spring, and remained at low levels until the fall when infection rates began to rise again. Since spring creek temperatures are relatively constant year-round, temperature does not appear to be a primary factor driving seasonal patterns of infection. At the three intensive sites, rainbow trout spawning occurred from February through early June. Fry emergence was protracted, occurring as early as March and continuing through August. Our cage results suggest that fry emerging during late spring or later are likely to avoid high infection, even in highly infected spring creeks. In contrast, fry of fall spawning rainbow trout may be much more susceptible to infection in these systems.